Pre-Conceptual Design of the Fuel and Materials Test Station at LANSCE

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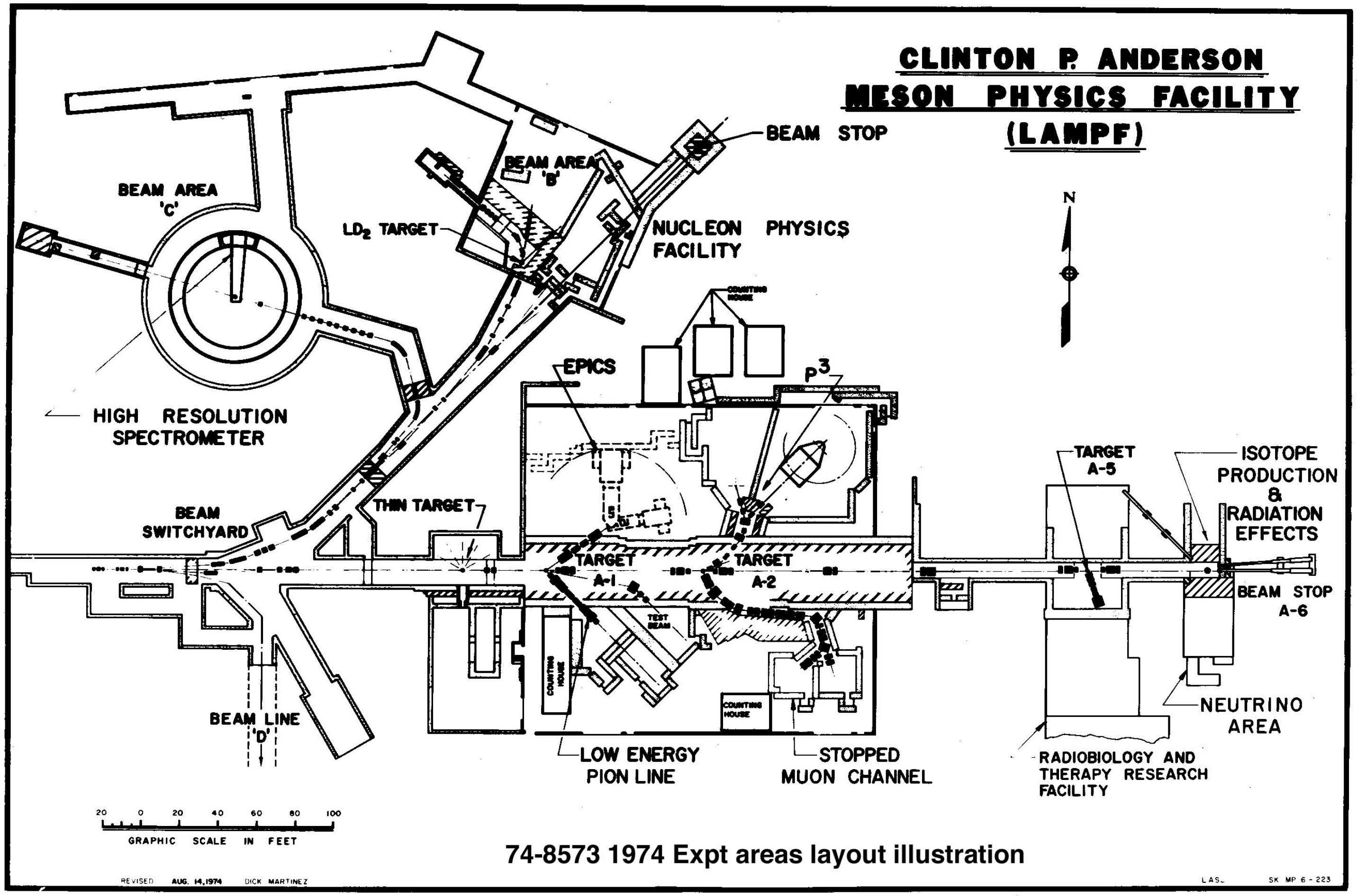
FMTS to be located at LANSCE Area A



74-8573 1974 Expt areas layout illustration

Features of the Fuels and Materials Test Station (FMTS)

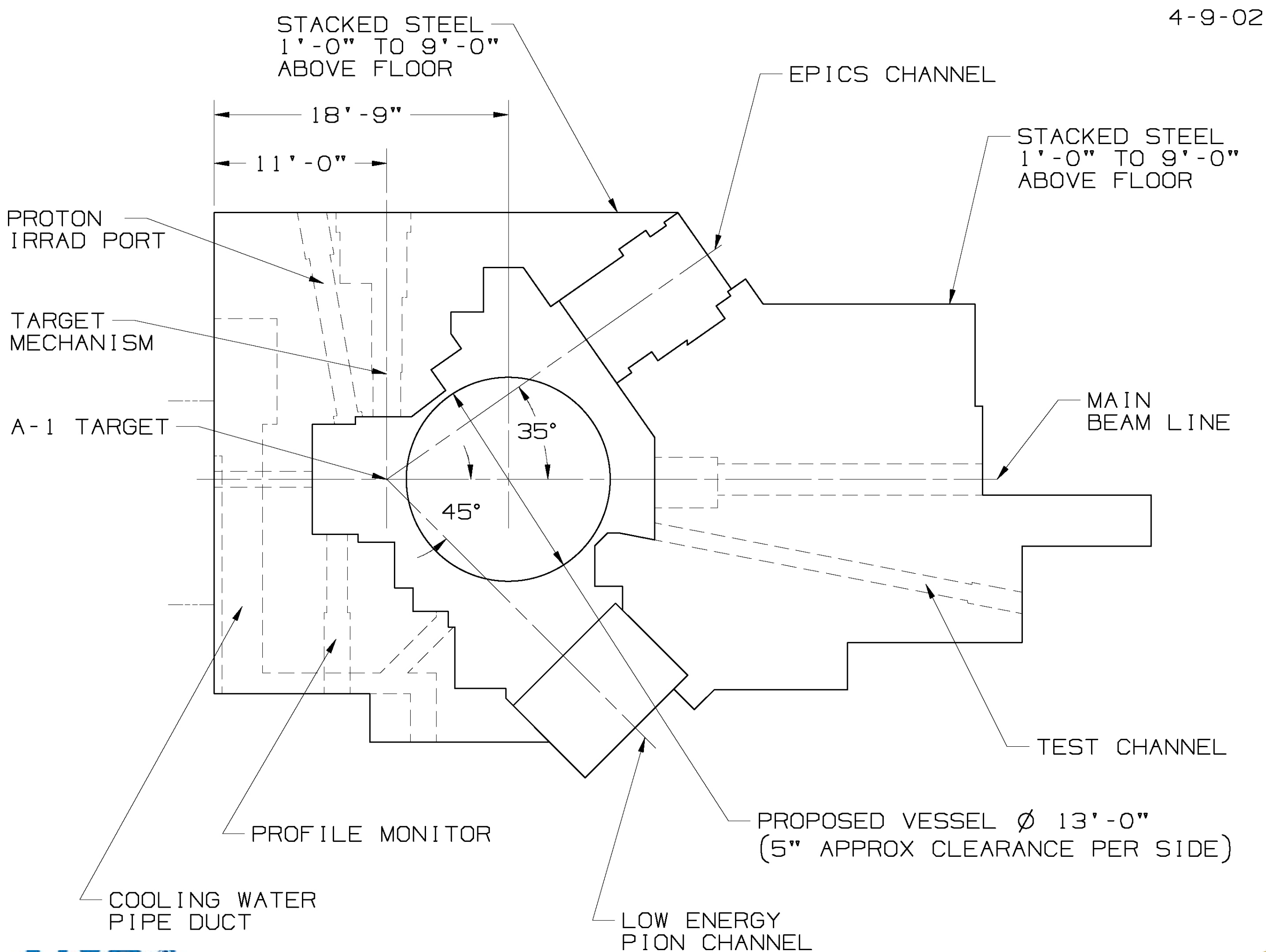
- Provide an irradiation environment for the testing of advanced nuclear fuels and structural materials.
- Provide a flexible facility with closed test loops that can use a variety of coolants (e.g., water, sodium, LBE).
- Use the underutilized LANSCE proton beam, second only to PSI's SINQ in power, to produce high neutron fluxes over small irradiation volumes.
- Use existing infrastructure to keep costs low.

FMTS proposed location is the A-1 target

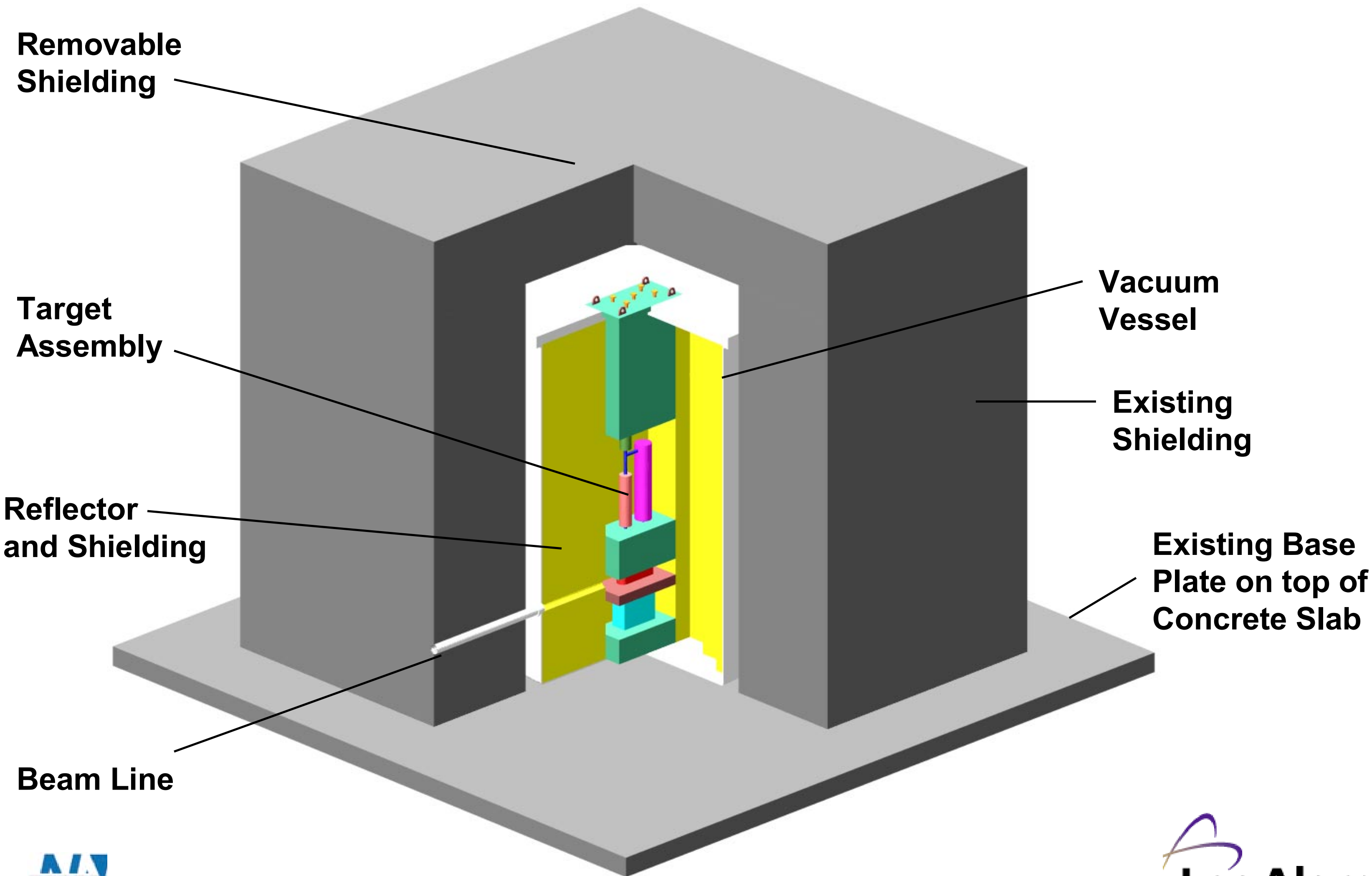
Area A in 1971

A-1 target during construction in 1973

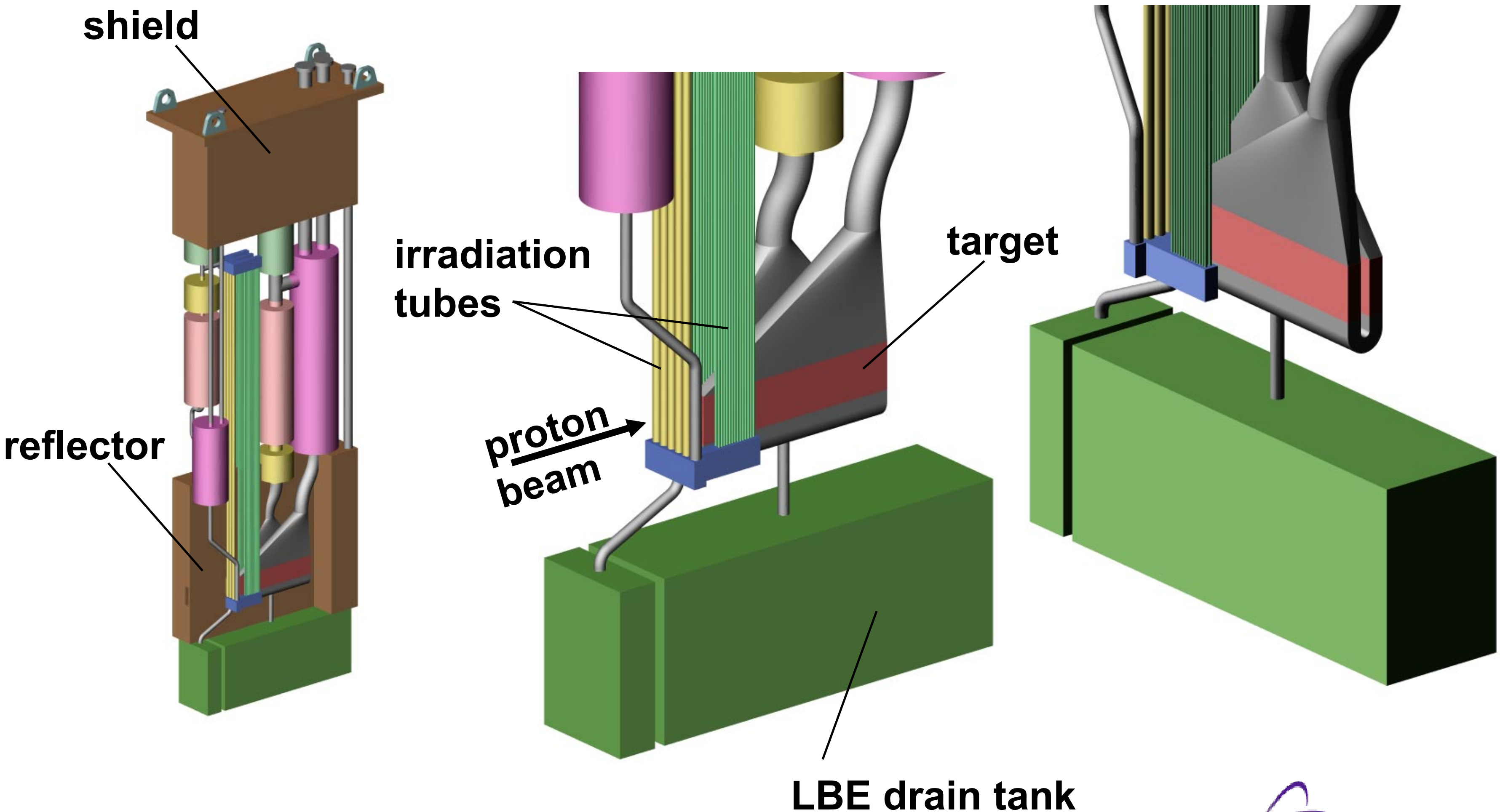
The A-1 location has room for a 13-foot-diameter vessel to contain the FMTS target



The FMTS target will be serviced from above using an existing 30-ton crane

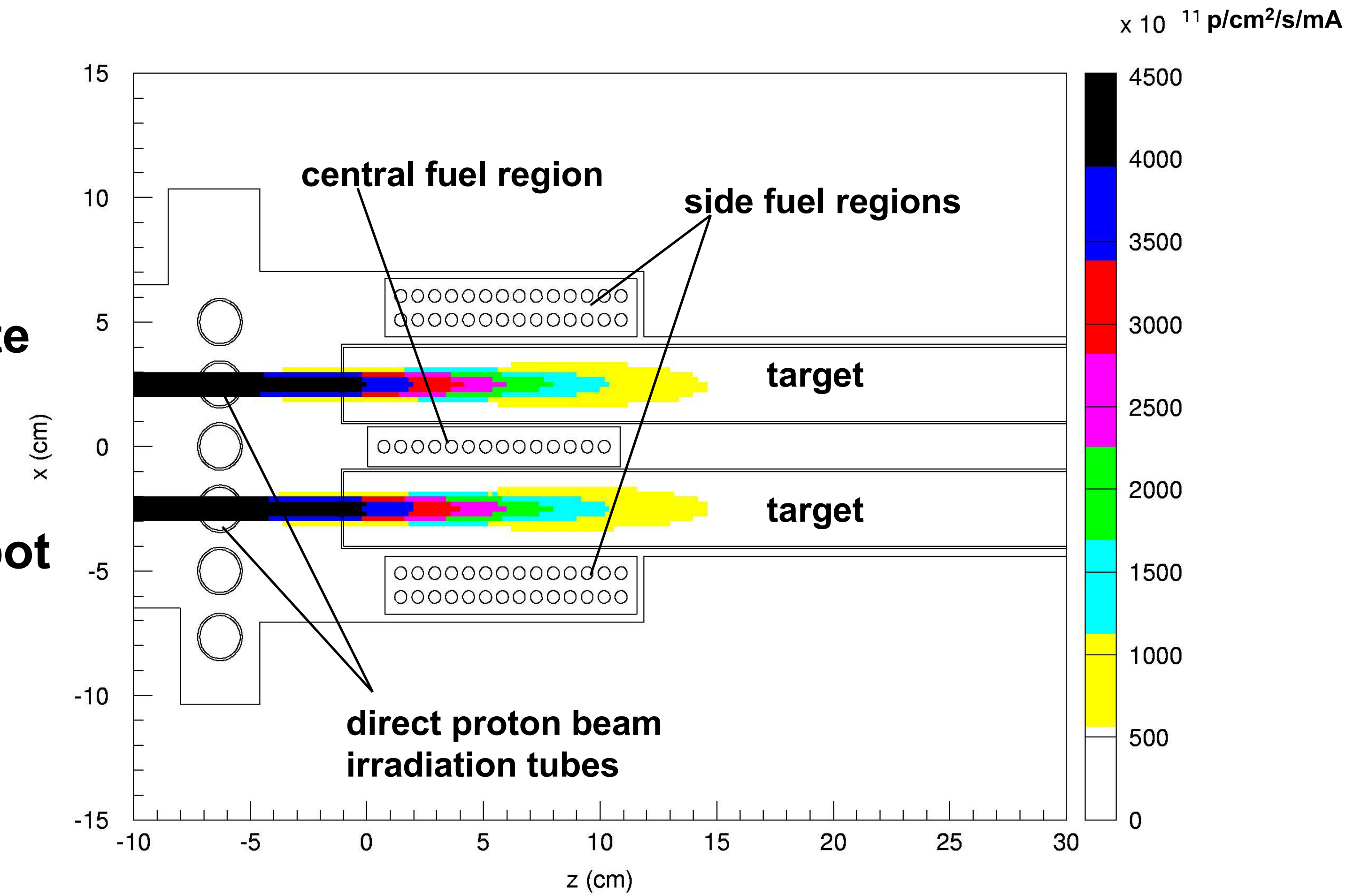


The target and irradiation tubes are attached to a 5-m-high stalk

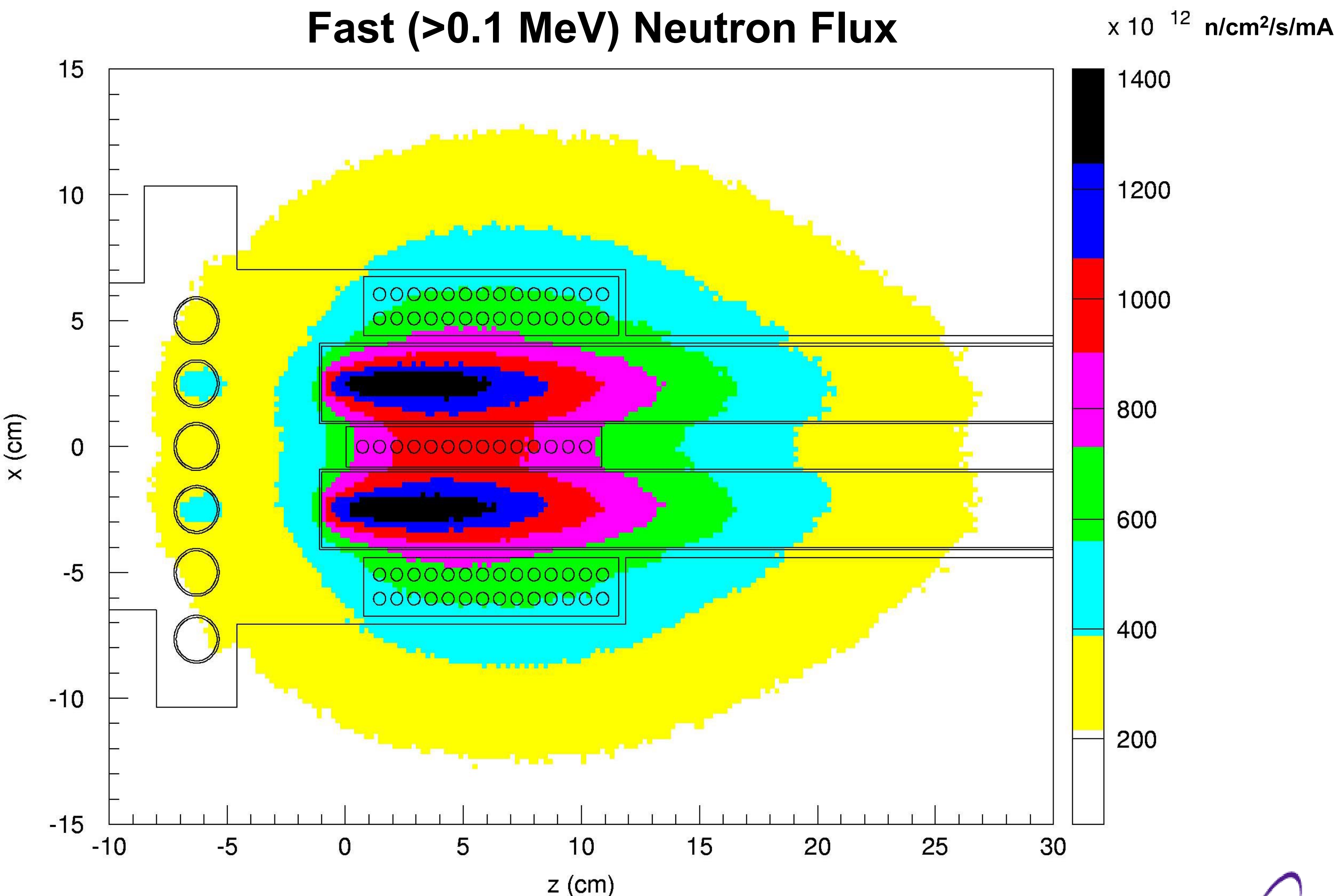


The pulsed nature of the LANSCE proton beam allows the use of a split spallation target

- **1-ms-long pulses are delivered at 120 Hz repetition rate**
- **The beam spot is alternated between two positions on the target**

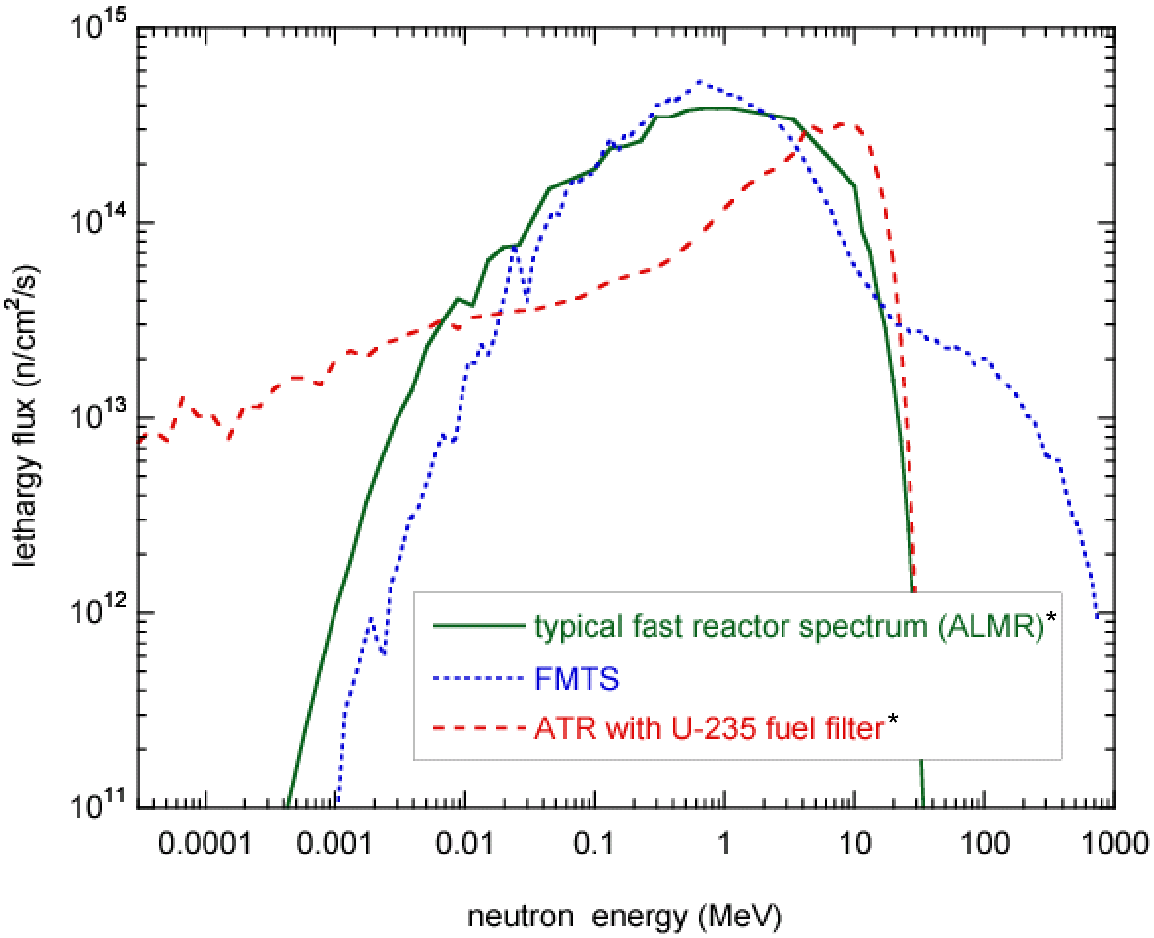


The split target produces a higher, more uniform neutron flux in the central fuel region



Below 20 MeV, the FMTS spectrum compares favorably with a typical fast reactor spectrum

- **Fast reactor spectrum normalized to a fast flux of 1×10^{15} n/cm^2/s**
- **Central fuel region of FMTS, LBE-cooled U target**
- **ATR with FNFB normalized to a fast flux of 8.5×10^{14} n/cm^2/s**



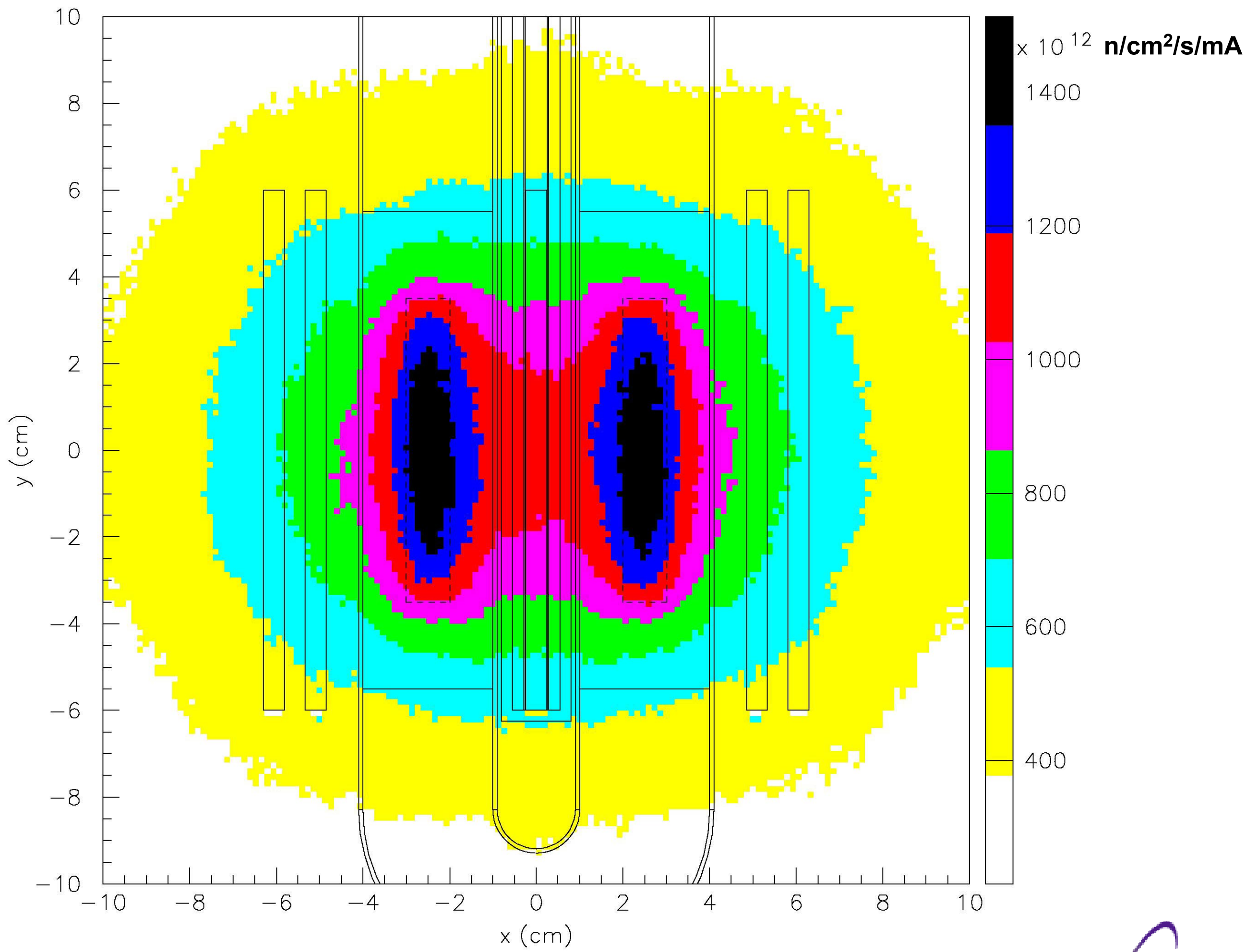
* Source: *A FAST NEUTRON FLUX BOOSTER TEST-FACILITY IN THE ATR FOR ADVANCED NUCLEAR FUEL AND MATERIAL TESTING*

The FMTS can provide a unique radiation environment for fuels and materials irradiations

- Pre-conceptual design shows that intense neutron flux is possible over a small volume.
- Wide mix of proton and neutron fluxes are produced.
- Safety assessment and authorization plan completed. Planned experiments are within the existing EIS.
- There are no criticality safety concerns.
- Closed loops provide a safe testing environment in various coolants.
- Facility can be built in 3 years for $20M.

backup slides

The neutron flux is fairly uniform over a 10-cm height



Performance Parameters for the LBE-cooled U Target

Position	Peak Neutron Flux (n/cm^2/s/mA)	Total High-E (>20 MeV) Neutron Flux (n/cm^2/s/mA)	Total Proton Flux (p/cm^2/s/mA)	Peak He Prodution Rate (appm/y/mA)	Peak Atomic Displacement Rate (dpa/y/mA)	He/dpa Ratio (appm/dpa)
enter fuel zone						
– upstream pin	7.70×10^{14}	2.26×10^{13}	3.79×10^{12}	2.49	6.06	0.41
– peak flux pin	1.00×10^{15}	2.77×10^{13}	4.84×10^{12}	3.71	7.34	0.51
arget window	8.20×10^{14}	3.04×10^{13}	4.30×10^{14}	591.85	43.61	13.57
n-beam materials ample position	4.48×10^{14}	1.36×10^{13}	4.60×10^{14}	514.50	30.22	16.99